APPARATUS FOR DEPOSITING A SHEET ON A STACK

The present invention relates to an apparatus for depositing a sheet on a stack, preferably for a delivery unit of a printing machine, which apparatus comprises at least one stacking device which can be driven so as to rotate about an axis of rotation in order to grasp and deposit the sheet, and which said apparatus comprises at least one drag element which is arranged on the stacking device and is dragged along during rotation, said drag element being provided for shifting the last-deposited sheet, specifically for pulling said sheet toward a stack abutment.

Devices of this type have been known from US Patents 5,068,880 and 5,194,558. In these documents, these devices feature a type of "wiper flap" designed to sweep the sheet that was last deposited on a stack to a stack edge. These wiper flaps are arranged on the rotating stacking device and, during the rotation of said stacking device, the respective wiper flap impinges on the last deposited sheet, thus pulling said sheet against the stack edge before the next sheet is deposited.

In the case of such a stacking device, respectively one sheet, which is to move along a transport path in order to be deposited, is fed to the stacking device, i.e., preferably into a mouth-like, preferably slit-like input means. Instead of the mouth, however, various elements together may form a type of input means. The sheet, which has been grasped in this way, is then deposited in that the stacking device rotates by approximately 180 degrees and, in so doing, causes the leading edge of the sheet grasped in the input means to strike a stack bar through which the stacking member will rotate because of a cutout provided on said stack bar. As a result of being retained at said stack bar, the leading edge of the sheet slips out of the input means and is ultimately released by said input means so that the released sheet drops onto the stack from a certain height. Due to manufacturing tolerances and stack differences or stack irregularities, heights on the order of approximately 15 mm may occur. Due to this remaining height, however, the sheet does not always drop exactly in vertical direction onto the stack bar retaining said sheet, but may potentially bounce, slip or drop at a distance away from the stack

edge. In order to create a precisely aligned stack, it is therefore necessary and desirable that the last deposited sheet be again pulled correctly toward the stack bar. However, the known wiper flaps are subject to considerable wear, and it is not exactly easy to reproduce them in view of the accuracy required for aligning a stack.

Therefore, an object of the present invention is to solve the problem of making the operation of aligning the last deposited sheet more reliable and more precise.

In accordance with the present invention, this problem has been solved in that there is at least one drag element which is arranged, relative to the axis of rotation, on at least one radial exterior side of the stacking device.

By arranging the drag element on the exterior side of the stacking member, the falling height of the sheet can be bridged in a targeted and precise manner in order to achieve a reliable alignment of the last deposited sheet.

Another development of the invention advantageously provides that the stacking members have at least one input means into which the leading edge of a sheet can be fed, and that the drag element is arranged, relative to the axis of rotation, on the radial exterior side of at least one input means.

As a result of this, respectively one drag element is assigned to respectively one input means, and the last deposited sheet is aligned precisely before the next sheet is released by the input means whose exterior side is just aligning the previously deposited sheet. In so doing, the drag element itself does not interfere with the stacking process on the outside of the input means because the drag element, corresponding to the position of rotation of the stacking device, is present only for alignment of the stack but does not enter, and is not located in, the stacking zone at the time of deposit.

As has already been indicated, each input means is preferably associated with a drag element.

This drag element may substantially have the configuration of a tongue and may preferably project outward from the exterior side of the stacking device or from the input means, i.e., preferably at an acute angle (wedge-shaped angle), against the direction of rotation of the stacking member which can be driven so as to rotate.

This measure allows that the height difference can be bridged in a precise manner, that the alignment is reliable and can be reproduced, and that, due to the angle (as in a windshield wiper), an effective and relatively wear-resistant use is achieved. The stacking rotation is not disrupted and, if necessary, a drag element can be manufactured in a cost-effective manner, and can be replaced and mounted easily.

In order to provide good elasticity and a relatively high coefficient of friction, the drag element preferably is made of a rubber-like material; however, in order to still provide a precise alignment, as well as stability, this drag element may be reinforced with metal.

An example of embodiment of the inventive device, which may result in additional inventive features and which does not restrict the scope of the present invention, is shown with reference to drawings. They show:

Fig. 1 an inventive device, in side elevation;

Fig. 2 a side elevation of a sheet-input section for the stacking member of a device of Fig. 1;

Fig. 3 a side elevation of a sheet-output section on the stacking member of a device of Fig. 1;

Fig. 4 a perspective view of the device of Fig. 1;

Fig. 5 a perspective view of a component of Fig. 4;

Fig. 6 another perspective view of the device of Fig. 4;

Fig. 7 a sectional view of the sheet-output section of Fig. 2, in a detailed perspective view; and

Fig. 8 a detailed perspective view of inventive drag elements.

Fig. 1 is a side elevation indicating a stacking device which can be driven so as to rotate in the direction of arrows 5. This stacking device is located at the end of a transport path 8 on which sheets move in transport direction 10 into the stacking member in order to be deposited on a stack 11. The leading edge of each sheet arriving at the end of transport path 8 is fed by means of transport rollers 9 into an input means of the stacking device. To do so, a threading section 3, with a loading bridge that can be pivoted in the direction of arrow 2, is provided. The sheet, which has been fed into an upper position of the stacking member in this manner is transported and flipped by the rotation of the stacking member by approximately 180 degrees into a lower position, and is deposited there on stack 11. This is achieved in that the stacking member rotates through a stack bar 12 which retains the sheet so as to release it from the stacking member and allow it to drop on stack 11. In so doing, the sheet drops by a height difference as indicated by reference number 6 in Fig. 1, which, for example, may be on the order of 15 mm. As a result of this, the sheet may potentially not be aligned precisely enough with stack bar 12. Therefore, drag elements 1 pull the sheet neatly against stack bar 12 before the subsequent sheet is deposited. These drag elements 1 are mounted to the outside of the stacking device. During rotation of the stacking device, the free ends of drag elements 1, which project from the exterior side of the stacking device, describe an outermost arc of a circle 7 as indicated in a chain line. As can easily be seen, this arc of a circle bisects the lower level of height difference 6 (also indicated in a chain line), which means that drag elements 1 bridge this height difference 6 in order to be able to pull the sheet last deposited on stack 11 toward stack bar 12.

Fig 2 shows a detail of a section of Fig. 1, namely threading section 3. As in all the following figures, the same components will have the same reference numbers as in Fig. 1.

The threading section comprises a pivoting loading bridge 22 which is shown in greater detail. Guided by this loading bridge 22, the leading edge of each sheet is threaded into the stacking device, more accurately, into a sheet accommodation means of this stacking device. The respective sheet accommodation means are formed by accommodation segments 13, 14 cooperating with sheet driving wheels 15, in which case accommodation segment 14 of Fig. 2 is still in input position and accommodation segment 13 is still in a waiting position before an input position. Accommodation segments 13 and 14 are arranged on independently coaxially rotating stacking members which can be actuated together, or independently by themselves, or together with said sheet driving wheels 15, as a stacking device or as stacking devices.

Each drag elements 1 is mounted to the exterior side of one of accommodation segments 13, 14 in a mounting section 16.

Fig. 3 also shows a detail of Fig. 1, namely the stacking section in the region of stack 11.

The stacking section shows accommodation segments 17 which are in sheet output position and are located diametrically opposed to sheet accommodation segments 13, 14. It can be recognized more clearly that these accommodation segments 17 move through a stack bar 12 while the picked up sheet is retained by stack bar 12 and, as a result of this, is released from the stacking device. Furthermore, it can be seen that a drag element 1 follows pivoting circle 7 until said drag element impinges on the uppermost sheet of stack 11, and then said drag element yields in the direction of arrow 4 and pulls this sheet toward stack bar 12.

Fig. 4 shows a perspective view of the stacking device.

A common axis of rotation supports coaxially, but substantially independently driven, two not specifically illustrated stacking members which support accommodation segments 13, 14 and 17 having drag elements 1, and sheet driving wheels 15 which mainly act as bending cores and abutments, and as the

transport drive for the sheets to be stacked. These elements grasp and support the sheets essentially across their entire width.

Furthermore, Fig. 4 shows that the drag elements are stiffened and reinforced on their reverse side with metal tongues 18, while they may otherwise consist of a rubber-like material.

Fig. 5 shows a component of Fig. 4. In particular, accommodation segments 13, 14 with their drag elements 1, and sheet driving wheels 15, are more specifically indicated.

Fig. 6 shows another perspective view of the stacking device.

Fig. 7 shows a component of Fig. 6 in the region of stack bar 12. It can be seen that accommodation segments 17 have a width that is adequate for transversely moving rollers 19 to roll off said segments in order to be able to shift a sheet – immediately before being deposited on stack 11 – slightly in a transverse direction, so as to create, for example, two partial stacks that are transversely offset for easier pick-up.

Also shown are laterally arranged sensors 20 and a central sensor 21, each detecting the currently reached stack height.

Fig. 8 shows an other, more detailed, perspective view of accommodation segments 13, 14 with their drag elements 1.